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ETHNOGRAPHY AND ANALYSIS: A TEST OF SOME ALGORITHMIC PROCEDURES

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One of the features of the present stage of network analysis is the proliferation of procedures of formal analysis. These procedures are usually, though not necessarily, incorporated into algorithms upon which computer programs may be based. Typically these contrasting methods of analysis proceed from somewhat different axioms relating to the network structure and therefore may achieve different results. Compare, for example, the results from approaches based on graph theory, structural balance, structural equivalence and algebraic topology.

At the present stage of development the emphasis seems to be on the methods of analysis themselves rather than on the use of the procedures to make manifest the otherwise latent patterns in empirical data. In order to illustrate the potential use of differing procedures in the analysis of a set of empirical data it was decided to subject the same set of data to as many contrasting methods of analysis as were available to the author on the computer to which he had access. These were necessarily limited but nevertheless represent three very different ways of analysing network data.

The data chosen for analysis were those in B. Kapferer's study of the events leading up to a strike in an African clothing factory. They are contained in Strategy and Transaction in an African Factory (1972), Manchester, Manchester University Press. Factors in favour of the choice of this material were that the data were presented in a form suitable for formal analysis (i.e. in adjacency matrices), the data were multiplex, they were originally analysed using techniques which by modern standards are relatively simple, the patterns in the data are not immediately apparent or obvious and the data are presented in terms of a specific hypothesis which links the proliferation of specific types of network ties with the establishment of sufficient conditions for a strike to take place.

Since the composition of the work force in the factory changed between an initial time point some six months before the strike took place and a subsequent time just before the strike did in fact occur, only those members of the factory who were present at both time periods are included in this analysis. Kapferer's basic hypothesis was that ties linking different types of operative, ranking in prestige from the Supervisors and head tailors at the top to the Cotton boys at the bottom, were insufficient at time 1 to command general support for industrial action. Due to the activities of particular individuals in the factory, however, the authority of the Supervisors was undermined and through an expansion of ties among workers who were formerly isolated from one another, sufficient common interest was established to enable joint action to take place. Kapferer distinguishes between two different components in social relationships. The first which he calls sociational relationships are those that are basically convivial ties amongst workers. These ties are less important for subsequent action than those links he calls 'instrumental' which imply the establishment of an obligation between actors. The latter are inherently asymmetric as against sociational relationships which are inherently symmetric.

The author conducted three different types of analysis. These were

1. Procedures based on graph theoretical notions such as star size, point centrality, span etc.

This type of analysis concentrates on the graph theoretical attributes of individual actors in the network, that is on what Burt calls 'relational' aspects rather than on the morphology of the network as a whole, or on what Burt calls positional aspects.

The change in first order star size from time 1 and time 2 for sociational relationships showed that Supervisors and Button machiners increased their star size more than the over-all change, while most operatives lower in prestige

than the line 1 tailors did not increase their star size as much as the over-all change. For instrumental links, however, the supervisors decreased their star size as against the line 1 tailors who were challenging their authority. In general similar patterns emerge for point centrality for both sociational and instrumental relationships. The pattern, however, is displayed most clearly for 'span' that is, the proportion of relationships mobilized by each member of the network. The gain or loss in instrumental links in order of prestige as compared with the linear trend between times 1 and 2 was Supervisors = -7.94; line 1 tailors = +5.50; line 2 tailors = +0.71; line 3 tailors = -4.10; button machiners = -0.36; ironers = -0.86; cotton boys = -4.47. This reflects the extent to which the line 1 tailors were expanding their instrumental links between times 1 and 2 and hence building up obligations for support when in due course the strike eventuated.

This analysis, conducted in terms different from that which Kapferer originally made, nonetheless in general supports his hypothesis.

2. Clustering

This is the procedure of aggregating individual members of the network to relatively dense clusters. When this has been achieved it is then possible to examine the extent to which these dense sets of social relationships coincide with structural variables of the members such as occupational status. The particular clustering procedure chosen here was basically Hubbell's 'clique detection' algorithm into which a hierarchical linkage procedure was incorporated.

Clusters were selected for use in the analysis in the light of the dendogram produced from the linkage procedure. The composition of these clusters for both sociational and instrumental ties at both times 1 and 2 show relatively close alignment with the occupational stratification of the work force (as measured by an asymmetric 'proportional reduction in error' tau-b) but the extent to which links had been spread between time 1 and time 2

is reflected in the reduced alignment of occupational alignment at time 2 for both sociational and instrumental relationships. Once again this is consistent with Kapferer's hypothesis.

3. Structural Equivalence

The data were analysed finally by CONCOR procedures. Since the object was to compare changes in links in blocks between time 1 and time 2 a blocking was established over both types of relationships at both time periods simultaneously. Changes between time 1 and time 2 for each type of relationship were then explored. The partitioning of the original matrices in terms of five block sets was used for analysis. The blocks thus isolated correlated well with occupational composition as measured by the PRE tau-b. The prediction of block membership from occupational category at time 1 suggested a 63 per cent reduction in error and a 57 per cent reduction at time 2. The drop in tau-b would be consistent with Kapferer's hypothesis. The change in block images between times 1 and 2 for both sociational and instrumental relationships show that while there is little change in sociational relationships, instrumental relationships show an extension of links between line 1 tailors and the blocks containing members from the lower end of the occupational ladder. There is also a diminution of links within blocks at the lower end of the occupational prestige scale suggesting an over-all decrease of polarization.

A more detailed analysis of the changes in density of intra- and inter-block ties based on the liner trend between times 1 and 2 showed that particularly for instrumental relationships the density of links between blocks with members from the upper end of the prestige scale increased in respect of those at the lower end of the scale whereas the inter-block and intra-block densities among members from the lower end of the prestige scale tended to decrease.

Once again this is consistent with Kapferer's basic hypothesis but the analysis using notions of structural equivalence isolated a block of five particular individuals of middle prestige ranking who dramatically increased

their intra- and inter-block densities between times 1 and 2. Recourse to the detailed descriptive material is needed in order to explain why this should be so.

The general conclusion, pending further more detailed analysis is that Kapferer's original formulation has stood up well to reanalysis using very different techniques of analysis. These analyses however have thrown up some secondary problems suggesting the need for some elaboration of the original analysis.